beyond the distal end of said passage, said enlarged distal portion being at least partially within and substantially blocking said passage when said pin is in its retracted position.

7. A gas assisted injection molding apparatus comprising:

a molding chamber;

a supply of pressurized gas;

a hollow conduit communicating with said gas supply and extending into said chamber;

a pin extending through said conduit and reciprocal between an extended position and a retracted position, said pin having an enlarged distal portion which is positioned at least partially within and substantially closes said conduit when said pin is in said retracted position; and

an electronic actuator reciprocating said pin.

REMARKS:

I **<u>Claim Rejections Under 35 U.S.C. §102</u>**

Claims 1, 3, and 5 stand rejected under 35 U.S.C. §102 as being anticipated by Berdan '967. Applicant has amended claim 1 as set forth above to include features not disclosed in Berdan '967. The amendment thus overcomes the rejections, and Applicant respectfully requests withdrawal of the same.

II Claim Rejections Under 35 U.S.C. §103

A. Combination of Berdan and Green

Claim 2 stands rejected under 35 U.S.C. §103 as being unpatentable over Berdan as applied to claim 1, and further in view of Green '101. At paragraph 5 of the instant Office Action, the Examiner states that it would have been obvious to one of ordinary skill in the art to modify Berdan to include complementary tapered portions on the enlarged tip portion and hollow passage as taught by Green '101 because it provides a better sealing due to the formation of a valve seat. Applicant has amended claim 1 to include features not disclosed in Berdan '967. Nevertheless, Applicant contends that even if all of the limitations of claim 2 could be found in the cited references, one of ordinary skill would not be motivated to make such a modification.

One of skill in the art would not look to the teachings of Green to modify Berdan because Green is non-analogous art. Green discloses a valve assembly that is directed to preventing rubber flow into a vent hole in a tire mold (specification column 3, lines 52-55). Green teaches a gas vent having a valve that includes a conical valve closure member 1 and a conical seat 6. However, valve opening and closing is controlled by rubber inside the mold impinging on the end face 12 of the closure member 1 (specification column 2, line 66-7; column 3, lines 1-9). Air inside the mold is expelled as the rubber is forced to the outer surfaces of the mold, and the valve is closed when the rubber surface forces closure member 1 down against its seat 6. In contrast, Berdan teaches a pneumatically operated assembly directed to supplying pressurized gas to a mold cavity in a gas assist injection molding apparatus. The valve is actuated by gas pressure acting on piston 78 and the underside of head 68 (specification column 4, lines

12-15). One of skill in the art of pneumatically actuated pressurized gas assisted injection molding apparatuses would not look to the teachings of a non-pneumatic tire mold venting assembly for suggested modifications. In light of this, Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. §103.

Even if Green were properly analogous, which it is not, there is no suggestion in Berdan, nor in the art generally, to make the modification suggested by the Examiner. If anything, Berdan suggests the contrary, and the assertion of obviousness cannot stand. In the specification at column 4, lines 19-21 it is stated:

> Upon completion of the molding process, the pressure is removed from the chamber 44 and the head 68 returns into sealing engagement with the end face 65 of the duct 60 under the influence of the spring 76. (Emphasis added)

There is nothing in the Berdan disclosure to suggest a need for "better sealing" as stated by the Examiner. Moreover, the Examiner has failed to indicate what a "better" seal is, and such may not even be possible. Even assuming, arguendo, that complementary tapered surfaces would provide a *superior* seal, the fluid flow characteristics at the distal end of the duct 60 would be fundamentally altered by such an overhaul of the tip design. Berdan discloses a reciprocating pin with a disc-shaped head, which acts as an opening pressure surface exposed to pneumatic pressure from duct 60. This pressure surface is oriented substantially perpendicular to the direction of fluid flow. Such a design contrasts sharply with a complementary tapered surface design, wherein the pressure surface is not oriented perpendicular to the direction of incident gas flow. Significant differences in the valve opening pressure, appropriate strength of the biasing spring that closes the valve, and gas flow rate at the valve tip would likely result from the modification the Examiner proposes.

At minimum, experimentation would be necessary to appreciate the characteristics of different tip designs. Furthermore, it is well known that the detailed machining necessary to produce complementary conical members can be significantly more time-intensive and expensive than preparation of the flattened surfaces taught in Berdan. Conventional wisdom in the art at the time of the invention would have disfavored the proposed modification, absent some compelling suggestion. The Examiner has pointed to no part of the Berdan specification demonstrating the need or desirability for a more effective (or otherwise better) seal at the tip. As such, one of skill in the art would not be motivated to make the suggested combination of features. The assertion that such a re-configuration would have been obvious to one of ordinary skill in the art is overcome, and Applicant respectfully requests withdrawal of the rejections to Claim 2 under 35 U.S.C. §103.

B. Combination of Berdan and Denne

Claim 4 stands rejected under 35 U.S.C. §103 as being unpatentable over Berdan as applied to claim 1, and further in view of Denne. At paragraph 6 of the instant Office Action, the Examiner asserts that it would have been obvious to one of ordinary skill in the art to modify Berdan with the addition of the electromagnetic actuator of Denne to drive the pin. Applicant has amended claim 1 to include limitations not disclosed in Berdan, overcoming the rejection. However, even if all the limitations of claim 4 could be found in the cited references, Applicant contends that the obviousness rejection would remain improper. There is no suggestion in Berdan, nor in the art generally, to modify the Berdan assembly to include an electromagnetic actuator of *any* type, much less the

type taught in Denne. For these reasons, the proposed modification cannot support an obviousness rejection and Applicant respectfully solicits withdrawal of the same.

Denne provides an actuator with a stroke "easily provided" from 0.2 meters to 1 meter, and maximally up to 3 meters (specification column 1, lines 54-55). The issue is not whether the combination is possible; the issue is whether there is a suggestion in the art to make the combination. One of ordinary skill in the art of pneumatic valve actuators would not look to the teachings of a reference disclosing an actuator with a stroke distance of 20 cm or more to improve control over a conical valve with a *substantially* shorter stroke distance, such as the one taught in Berdan. This combination is anything but obvious.

Further, one of ordinary skill would not be motivated to incorporate *any* electromagnetic actuator into the Berdan device. In Berdan, valve opening occurs due to gas pressure acting on head 68 and piston 78 which lifts the valve member to move the head 68 away from the end face 65 of supply duct 60, allowing gas to be injected into the interior of the cavity 22 (specification column 4, lines 13-17). As the gas pressure in cavity 22 approaches the gas supply pressure, the rate of gas flow into cavity 22 decreases, as does the pneumatic force lifting head 68. When the pneumatic force drops below the opposing force of return spring 76, head 68 begins to drop back toward its rest position against face 65 under the bias of spring 76 (specification column 4, lines 19-22). Thus, Berdan automatically controls valve actuation in response to the difference between the gas supply pressure and the gas pressure in the mold cavity. Modifying Berdan to include an electromagnetic actuator would require an independent timing and control system for valve actuation. The actuator would be duplicative of the spring force

in one direction and would have to overcome the spring force in the other direction, which would actually impede the operation of the device. Even assuming such a modification would improve valve control and/or precision, which there is no evidence it would do, Berdan nowhere suggests that improved control would be desirable, nor justify the added complexity and expense of such a modification. One of skill in the art would thus not be motivated to incorporate an electromagnetic actuator to Berdan, and Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. §103.

C. Combination of Berdan and Terao

Claim 6 stands rejected under 35 U.S.C. §103 as being unpatentable over Berdan as applied to claim 1 above, and further in view of Terao et al. At paragraph 7, the Examiner asserts that "it would have been obvious to one of ordinary skill in the art to modify Berdan with the substitution of a ball screw drive as taught by Terao as drives for reciprocating the pin because it is a well known alternative drive means for reciprocating movement." Applicant's amendment to claim 1 adds limitations not present in Berdan. However, even if all the limitations of claim 6 could be found in the cited references, Applicant submits that the Examiner's proposed combination would not have been obvious to one of ordinary skill in the art, and Berdan actually teaches away from such a combination.

One of ordinary skill in the art of fluid-assisted injection molding apparatuses would not look to the teachings of Terao to discover alternative drive means for reciprocating a pin. Terao is non-analogous art disclosing a relatively complex hybrid pneumatic/electrical device that positions a table 46 (upon which a workpiece is placed)

at a desired position in a multi-step fashion. In particular, the Terao apparatus moves table 46 with an initial pneumatic action (specification column 7, lines 54-67). Other than an initial pneumatic displacement, however, functional and structural similarity to the presently disclosed device is absent. The table 46 is brought to a predetermined end position X2 under the action of an electric motor 26 (Col. 8, lines 17-33), which rotates a threaded shaft 72 operably coupled to table 46. To return table 46 and the workpiece back to the starting position X1, the electric motor 46 and pneumatic action are again employed (Col. 8, line 44-Col. 9, line 7). Moreover, Terao contemplates that reciprocation of the table 46 takes place in part due to the weight of the workpiece positioned on the table (Col. 8, lines 53-55). The Examiner states at paragraph 7 that Terao teaches a well-known alternative drive means for reciprocating movement. While this assertion might be accurate in the art of workpiece positioning mechanisms, it certainly does not hold true in the field of gas-assist injection molding. Thus, one of ordinary skill in the art would not look to the teachings of a device such as Terao for alternatives to a spring-biased pneumatic valve opening system for a gas-assisted injection molding apparatus, and the rejection is overcome.

Not only is Terao non-analogous art, there is no suggestion to modify Berdan with any alternative reciprocation means, as previously discussed, much less the drive means disclosed in Terao. If anything, the use of automated valve closure in Berdan suggests the opposite. In Berdan, valve opening occurs due to gas pressure acting on head 68 and piston 78 which lifts the valve member to move the head 68 away from the end face 65 of supply duct 60, allowing gas to be injected into the interior of the cavity 22 (specification column 4, lines 13-17). As the gas pressure in cavity 22 approaches the gas supply

pressure, the net pneumatic force lifting head 68 decreases. When the force drops below the opposing force of return spring 76, head 68 begins to drop back toward its rest position against face 65 under the bias of spring 76 (specification column 4, lines 19-22). If one were to modify Berdan to include the ball screw drive of Terao, as suggested by the Examiner, it would be necessary to operate the drive in a multi-step fashion to open and close the valve, and the valve could not close *automatically*, as it does with Berdan's existing pneumatic system. Conventional wisdom in the art would suggest that the addition of a complex gearing and drive mechanism such as a ball screw drive would require more space, add significant expense, and add unnecessary complexity. The spring of Berdan would be completely useless. Furthermore, Berdan's automatic closing feature would be compromised, requiring an independent drive control system for monitoring the proper valve closing and opening times. The suggestion that combining a ball screw drive with the valve assembly from Berdan would have been obvious is thus untenable, and Applicant respectfully requests withdrawal of the §103 rejection.

Claims 7-9 stand rejected under 35 U.S.C. §103 as being unpatentable over Berdan in view of Denne. At paragraph 8 of the instant Office Action, the Examiner states that it would have been obvious to one of ordinary skill in the art to modify Berdan to include an electronic actuator and electronic controller as taught by Denne to drive the pin because it provides an actuator that is capable of providing control and precision missing from pneumatic actuators. Applicant has amended claim 7 to include limitations not disclosed in Berdan, however, even if all the limitations of claim 7 were disclosed in the cited references, they could not support an obviousness rejection. There would be no motivation to one of ordinary skill in the art to modify Berdan to include an

electromagnetic actuator such as the type taught in Denne or, for that matter, *any* electromagnetic actuator. This is so for the same reasons expressed with respect to the §103 rejections made to claim 4 above, and reference may be made thereto. Applicant therefore respectfully requests withdrawal of the rejections to claims 7-9 under 35 U.S.C. §103.

Claim 10 stands rejected under 35 U.S.C. §103 as being unpatentable over Berdan in view of Denne as applied to claim 7 and further in view of Green. At paragraph 9 of the instant Office Action, the Examiner asserts that it would have been obvious to one of ordinary skill in the art to modify Berdan with complementary tapered portions as taught by Green because it provides a better sealing due to the formation of a valve seat. In view of the amendment to claim 7, the cited references do not teach all the limitations of the present invention. Even if all the limitations of claim 10 were present in the cited references, however, Applicant contends that such a combination would not have been obvious. There would be no motivation to one of ordinary skill to make the proposed modification. Green is non-analogous art, and no suggestion is presented by Berdan or the art generally to incorporate the tapered surface valve design. The rejection is thus traversed for the same reasons presented with respect to claim 2 above, and reference is made thereto. For those reasons, Applicant respectfully requests withdrawal of the rejection under 35 U.S.C. §103.

III Conclusion

WHEREFORE, all of the submitted claims are believed to be in condition for allowance, which is respectfully solicited. If the Applicant may be of any further assistance in providing information, or in the prosecution of this application in any way, the Examiner is invited to contact the undersigned attorney at (248) 362-2800.

Respectfully submitted,

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